

# PATENT SPECIFICATION

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## (54) A METHOD OF CONTINUOUSLY MEASURING A NUMBER OF UNDERWATER PARAMETERS AND SIMULTANEOUSLY TRANSMITTING THE MEASURED PARAMETERS TO A SHIP

(71) We, MORSKI INSTYTUT RYBACKI, of 1 Al Zjednoczenia, Gdynia, Poland, an institute organised and existing under the laws of Poland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to a method of continuously measuring a number of underwater parameters and simultaneously transmitting the measured parameters on board ship.

Fishing sets are not only run under water, usually at remarkable depths, but they also follow far behind the ship. During the trawling action, individual components of the fishing gear undergo considerable spatial changes, and in addition, they alter their usual mutual alignment, i.e. they change their angular position relative to each other. These changes in mutual setting of components basically influence the operation of other component units as well as the operation of the whole fishing gear and its coaction with the trawling ship both directly and indirectly, whereby the functional relationships are very complicated.

There are known methods used to take measurements of separate, preselected parameters. Among such parameters are; forces occurring in underwater components, these forces being measured by underwater dynamometers; vertical and horizontal openings, measured with relevant vertical opening gauges and horizontal opening gauges; angles formed through different setting of components, measured by means of underwater anglegraphs; and, the speed of each component in motion, measured by the use of underwater logs fitted with suitable recorders. Other essential parameters to be determined are the depths of the various parts of the gear measured by depth gauges. In addition to the parameters of the under-

water components specified above, the ship operation parameters, and other relevant data are measured.

Till now, there have not been known, however, methods for continuous and simultaneous measurement of a number of different parameters, and still less, of all specified parameters at one time, with their simultaneous transmitting on board ship.

An object of this invention is to provide a continuous underwater measurement of a number of different parameters with immediate and continuous transmission of the data to a ship so as to ensure availability of physical quantities for the determination of fishing gear parameters. It is the variations of the trawling set and the performance of the ship under various trawling conditions that is to be investigated. As a result of such measurements, one can readily introduce amendments in the reinforcement and construction of trawling fishing sets. Other objects are to determine properties of both in-use as well as proposed trawling sets, to ensure optimum selection of area of operation for the fishing vessel; optimum selection of trawling set combination, to allow systematic improvements in the general designing methods of such fishing sets, and observation of the fishing process from the viewpoint of its automatization potentialities. Still another object of the present invention is to establish suitable tactics for trawl sea-fishing programmes.

Objects, as set forth above, have been met by devising a new process of measurement in which a multiple-gauge measuring system has been combined with computer facilities.

According to the present invention there is provided a method of continuously measuring a number of different underwater parameters and simultaneously transmitting signals representing the said measured parameters to a ship, comprising installing

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a plurality of transducers, each adapted to measure the required different parameter, on relevant points of a trawling apparatus, obtaining from the respective transducers, signals representing the said parameters, feeding the signals from the transducers to an underwater telemetering station located on the trawling apparatus wherein the signals are multiplexed to form a composite signal, and transmitting the composite signal to a computer on board ship by cable, and supplying power for the transducers and the telemetering station from the ship by cables.

The outputs of the underwater transducers are intensified by amplifiers located in the underwater transducers so that all the signals have a predetermined amplitude sufficient to overcome the effect of noise and interference.

Another feature of the invention is that internal circuits of the separate transducers are electrically insulated from transmission lines in order that transducer outputs are independent of the fluctuations in line insulation normally found in sea water environment.

It is also important that all underwater sub-units, i.e. the transducers and the telemetering station are protected against overvoltage and short-circuit effects, likely to take place in the transmission lines, by known overload electronic circuitry provided on inputs and outputs and operative in the case of emergency or disturbance.

The outputs from the underwater telemetering station are fed to the on board computer by cable using a pulse-code modulation system.

The outputs from the transducers are fed to the telemetering station inputs where they are sampled in a preselected sequence controllable, for example from the computer desk, or according to a preset programme. The signals are then coded, multiplexed and transmitted to a computer installed on board ship.

The speed of measuring information delivered from the transducers is adapted to suit computer speed.

Among the technical and operational consequences of this invention, is, the achievement of the above mentioned direct and indirect objects hitherto not possible with known methods. The method according to this invention provides simultaneously information on a great number of different parameters. This information may be immediately processed thus providing a wide information basis for the process under observation. The method provides, also, very precise information on the measured dynamic states of the fishing set, this information being especially useful in the design of systems for the automatiza-

tion of fishing operations, including capacity of the trawling set, trawling with guidance of net to enclose fish shoals, etc. Also, the method according to this invention allows immediate action to be taken to influence the course of the fishing process. The method offers also the possibility of using all measurements in a comparable way when it is introduced on industrial vessels, in particular, vessels with less-developed measuring systems than found on specialised fishing vessels. In this way, the range of research being carried out is considerably widened. The method according to this invention results in the raising of the standards of design and construction of fishing vessels and trawling units.

#### WHAT WE CLAIM IS:—

1. A method of continuously measuring a number of different underwater parameters and simultaneously transmitting signals representing the said measured parameters to a ship, comprising installing a plurality of transducers, each adapted to measure the required different parameter, on relevant points of a trawling apparatus, obtaining from the respective transducers, signals representing the said parameters, feeding the signals from the transducers to an underwater telemetering station located on the trawling apparatus wherein the signals are multiplexed to form a composite signal, and transmitting the composite signal to a computer on board ship by cable, the power supply for the transducers and the telemetering station being supplied by cables from the ship.

2. The method as claimed in Claim 1, wherein the signals from the transducers are pulse code modulated in the underwater telemetering station and the pulse code modulated signal is transmitted to the computer on board ship by cable.

3. The method as claimed in any preceding Claim, wherein the outputs of the underwater transducers are amplified by amplifiers located in the underwater transducers so that all the signals have a predetermined amplitude sufficient to overcome the effect of noise and interference.

4. The method as claimed in any preceding Claim, wherein the internal circuitry of each individual transducer is electrically insulated from transmission lines so that the outputs are independent of fluctuations in line insulation.

5. The method claimed in any preceding Claim, wherein the underwater units are protected against overvoltage and short-circuit effects in transmission lines by electronic overload circuitry responsive to surge currents, short circuits and similar faults.

6. The method claimed in any preceding Claim, in which the speed of information, based on data measured, supplied from the

underwater transducers by way of the submarine telemetering station to the computer input on board ship is readjusted to meet operational speed requirements of the computer in use.

5 7. A method of continuously measuring a number of different underwater parameters and simultaneously transmitting the measured parameters to a ship substantially  
10 has hereinabove described.

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